THE EARLY DIAGNOSIS OF TUBERCULOSIS IN CHILDREN.

THESIS

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by

David Henry Russell, M.C.

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Medical Superintendent Wemyss Memorial Hospital.

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Introduction.

Since the discovery of the Tubercle Bacillus by Koch 35 years ago, a vast amount of data has been discovered with reference to Tuberculous disease at all ages. It is now agreed by most authorities that the Bacillus is ubiquitous and that in spite of the utmost care, infection at one time or other is unavoidable, and it will not be out of place at the outset to indicate some of the more important statistics bearing on the prevalence of Tuberculosis in childhood.

On autopsies on children at different ages, Beitzke finds the following figures:-

Newly Born.	Nil per cent.	Tuberculosis
0 - 1 year	10.1 "	"
1 - 5 years	41.3 "	"
6 - 15 years	65.4 "	"

These figures which have been corroborated by the investigations of Müller, Hamburger and Slaka, and Sehlbach, give some idea of the enormous prevalence of the disease, and one is therefore justified in making the assumption that Tuberculosis is practically universal in children, either latent or active.

The effect of this large proportion of tubercular children/

children is at once apparent in the mortality statistics, although from the chronicity of the disease and its insidious course it is impossible to give a true estimate of the damage caused in early years by the Tubercle Bacillus, and the death rate is very far from giving a true criterion of the prevalence of the disease.

In England and Wales in the year 1902, the death rate from all causes among children under 5 years of age, was 49.07 per 1,000 living; 3.06 of this total were due to Tuberculosis. But Tuberculous disease of the cervical glands is very common in children, causing much impairment of health, but not often ending in death. Similarly with Tuberculosis of the Bones, Joints and Skin; the victims of which although crippled and scarred, still survive.

According to Still, in England amongst 500 consecutive autopsies in children suffering from Tuberculosis, the highest rate - 25% - occurred between 1 and 2 years of age, and fell gradually to a very much smaller percentage after the age of 6. This has been corroborated by Gittings in America, and, Cornet who gives extensive figures, shows an average death rate from Tuberculosis of 25 per 10,000 during the first year to 5 per 10,000 during the 5th to 10th years, a rise to 7 per 10,000 from the 10th to the 15th years, and thereafter a steady rise to the 70th year.

The/

The majority of tuberculous infections, however, do not give an immediately fatal result, and before we can discuss the frequency of the disease, we must resort either to clinical observation or to laboratory methods of diagnosis. The latter would appear to be the more exact and the Tuberculin reaction is generally accepted as the test by which the presence or absence of a tuberculous focus is assumed.

The Von Pirquet or cutaneous test is that generally employed in young children and it is interesting to note the figures for the Children's Hospital, Philadelphia, viz.,

Number of Patients tested - 1,219
Positive reactions under 1 year = 15%

From 1 to 8 years, the percentage gradually rises to 42.0 per cent at the latter age, from 8 to 10 years, 32.6% and from 10 to 12 years 31%. These figures show a definite rise from birth to puberty, and Von Pirquet himself found a similar increase, as did Hamburger and Monte, but with a much more rapid rise, reaching 94% of positive results at 12 years of age.

It is believed from a study of such statistics that a weak infection with the Tubercle Bacillus in childhood may confer a certain amount of immunity in adult age; whether this is the case or not is still doubtful, but we certainly may assume that tuberculosis in early childhood is of extreme danger, but once the first period is passed, i.e. up to the 5th year, a mild/

mild infection from a well diluted Bovine source is probably of considerable protective value during the first two decades of life.

On this basis we estimate the importance of accurately diagnosing and dealing with cases of early tubercular infection in children, with the view of preventing massive or frequently repeated infection before immunity is established.

In children the mode of infection and spread of tuberculosis differs materially from that in adults. In both the seed is most commonly sown in the lung area, but after that the resulting disease seems to run a different course. The lymphatic structures are largest and most prominent in the early years of life, and as they form in all cases the main defense against the disease, it follows that the glands around the lung root enlarge rapidly and, in the very young, caseate early and spread to a general infection, while in older children the disease may be held up in the lymphatic system, the original focus in the lung may heal, but a chain of glands is left in which the disease may be smouldering for long periods, and again become active owing to some general weakness in later years.

Thus we see that in the later years of childhood or in early adult life, such glands may form clinically, the primary focus from which the disease may spread again to the lungs or other/

other organs.

There are therefore two well marked stages of the disease. The first in which the infection is limited to the glands, and known as Tuberculosis of the Thoracic Glands, or Hilus Tuberculosis, and a second stage in which the disease has overstepped the glands and appears in other parts. Hilus Tuberculosis may be manifest or occult, and when manifest there are two ways by which the diseased glands give notice of their presence:-

(1) By the disease spreading directly to the lung,
(2) By the great enlargement and in consequence, pressure on neighbouring organs.

Prior to the adaptation of Radiology to chest disease, the recognition of occult Hilus Tuberculosis was frequently impossible during life, as very considerable enlargement of the bronchial glands is possible without the production of any physical signs or symptoms. But matters have fortunately advanced greatly in recent years, as by means of the X-Rays, early enlargement of the Thoracic glands may be detected and treatment, care and vigilance instituted at a much more hopeful stage of the disease.

As a general medical practitioner dealing very largely with children in a large mining and industrial centre, the subject of Tuberculous disease has interested me greatly, and I feel that the more this dreaded disease is investigated and the/

the earlier the cases of it are detected, the better their chance of ultimately healing and becoming healthy and useful citizens.

In this Thesis I intend to give a general account of the question of Tuberculous disease in children, with special reference to the manifestations and diagnosis of early cases.

Diagnosis.

In making a diagnosis of Tuberculosis, what we really require to determine is whether the Tuberculous process is active, or latent or occult. In the one - active tuberculosis, the disease has produced lesions which are causing ill-health, with local or general symptoms; and in the other - latent tuberculosis, tuberculous infection has taken place but may not have given rise to any lesions demonstrable by ordinary clinical methods. This latent infection may under favourable conditions remain harmless during a lifetime, but any untoward occurrence, and transient irritation or lowering of the general health may give fresh impetus to the seeds already sown, which become a dangerous menace to the child's health. The recognition of a latent stage of the disease is a recent addition to our knowledge of tuberculosis, obtained from the laboratory and post-mortem room, and also from the experience and observation of operating surgeons, who, with the help of X-rays, have taught us much of the early and concealed stage of the disease.

As/

As Gittings well says, a safe and general rule is to consider Tuberculosis as a possible explanation in every case of mal-nutrition which eludes analysis, and in every case of protracted fever. Nevertheless, the diagnosis must not be made on insufficient data, for such a diagnosis carries with it a heavy responsibility and should never be voiced except on good evidence.

There are several methods of diagnosis which I shall classify under the following headings:-

1. History.
2. Early Physical signs and symptoms.
3. The Tuberculin tests.
4. The Laboratory tests.
5. Radiography.

1.) History. In investigating a suspected case of tuberculosis, nothing is more important than a careful consideration of the previous history and with it the family history.

For centuries past the belief in the heriditary factor has been held most strongly, not only by the medical profession, but also by the laity; but now as the disease and its real nature is gradually being better understood, the influence of infection is becoming more and more apparent.

It is now contended that what is transmitted is not so much a special predisposition to tuberculosis, but a general weakness rendering the offspring particularly susceptible to any disease, and that an early infection occurs in the home from/

from other members of the family. Cornet, indeed, states that "Heridity" means "infection" and, unless infection actually occurs, the children of tuberculous stock are as free from tuberculosis as any.

We thus see the importance of an accurate and well investigated history, not only of the child's previous health, but also of all the other members of its home circle, as well as all persons with whom it has been associated intimately. I can quote as an instance of this the case of a miner's child, aged 3, who died after a short illness from tubercular meningitis. The parents are both in thoroughly good health, as also the other children, 7 in number, and absolutely no family infection could be suspected, but it was discovered that the child had been particularly attached to a young girl in the next house, who was obviously a tuberculous subject, and suffering from a strumous iritis, and I attribute the infection to this cause. One must note also under the heading of previous history, the child's environment as amidst poverty, filth, overcrowding and lack of fresh air, tuberculosis will always find its largest proportion of victims. Williamson in his report on the cities of Scotland, found that 80% of cases of tuberculosis occurred in houses of three rooms or less.

2.) Early Physical signs and symptoms. In spite of the new tests which have been introduced and which will be dealt/

dealt with fully, the importance of physical signs and symptoms must not be lost sight of. The symptoms are of value in that they bring the patient to the physician and tend to direct the attention of the latter into the right channel, but they can of themselves never supply the means of diagnosis. They lead us to the threshold of discovery, the final and accurate diagnosis being obtained by instrumental and scientific tests.

I shall at first discuss the symptoms common to all tuberculous disease, and shall later refer to the regional symptomatology.

The most constant and important general symptoms of early tuberculosis are:- wasting, langour and fever.

Wasting is a constant feature in children who have tuberculosis, but loss of flesh or failure to gain weight is most readily brought about in a child, and before this symptom can help us in our diagnosis we must eliminate the more common and less serious causes which produce it, gastro-intestinal disorders and Ricketts. This can readily and quickly be done, and we find therefore that the regular weighting of children is of material help in detecting those in whom tuberculous infection has occurred and puts the clinician on his guard.

Langour. This is perhaps the earliest and in the opinion of many Authorities, notably Sir James Fowler, the symptom of primary importance in pulmonary tuberculosis, either in children or adults. An adult will state that for a varying period he has/

has felt tired - he has lost his vigour and energy, and a child of younger years loses his interest in his play, he lies about, leaves his companions to rest. This is a frequent indication of an early and probably an occult tuberculosis, but again, although no other signs of ill health are present, it nevertheless awakens suspicions, and should indicate the adoption of other tests, which might verify the diagnosis of a tubercular infection.

Fever. W. Taylor Cummins reports in his paper on Tuberculosis, an interesting study of the temperatures of healthy children in the Orphan Asylum, Detroit. The temperatures of all healthy children were taken night and morning for 14 days. 42% of the readings gave a temperature of 99° or over, with the majority of the higher readings in the evenings. He also gives other authentic investigations with their results, and we are therefore forced to conclude that the normal temperature in children is difficult to fix.

Riviere after an exhaustive summary of the figures relating to the subject, states that a "few points" must be allowed in childhood, both above and below the normal limits for adults; and he concludes that distinct fever is a valuable indication, but that its absence does not exclude tuberculosis, and that on the whole the temperature plays a much smaller part in aiding the diagnosis in children than it does in adults.

Finlayson/

Finlayson, in the Glasgow Medical journal, discusses this point, and gives his observations on healthy and tuberculous children. The average morning temperature is much the same in both cases, but in the tuberculous, the evening rise averages 99.9, as against 97.5 in the non-tuberculous, which fact is very suggestive and should be taken into account.

Sputum. The question of the examination of the sputum for Tubercle Bacilli does not unfortunately help us very much during childhood. In young children it is always swallowed, and even if obtained by artificial means, is found rarely to contain Tubercle Bacilli, except in advanced disease. This fact is easily explained by the particular means of spread and arrest of the disease in the glands outside the lung tissue, the destructive process therefore, together with the bacilli does not reach the lungs and bronchi until these glands have broken down and considerable ulceration into the air passages has occurred. Riviere in his book "Tuberculosis in Children" mentions the manner of obtaining the sputum recommended by Holt - tickling the pharynx with a piece of muslin held in a pressure forceps, and during the resulting paroxysm of cough, wiping up the secretion for investigation - and it would appear that by this means Holt was able to demonstrate the Bacillus in fully 80% of his cases. Other investigators have not been so successful, and we may conclude/

conclude that a negative finding in such secretions, as we are able to obtain, in no way precludes the probability of infection. We see therefore that in early childhood a definite conclusion is not likely to be arrived at from the examination of the sputum, but in a certain type of infection this procedure will help, namely, in an acute attack when the disease is ushered in by Broncho-Pneumonia, and in Tuberculous conditions, with caseating Pneumonic patches, the secretion from which, very frequently contains the bacillus and gives us a sure guide in future prognosis.

In a recent conversation which I had with Dr. Munro of Glenlomond Sanatorium, I learnt from him of the following method of concentration of the bacilli; in sputa which give a negative finding of the simple film method, and which method Dr. Munro has found to be the most effective, to the sputum left in the collecting outfit is added an equal quantity of the following:-

Jousset's Digestive.

%	Pepsin	grs. 2
	Glycerine	c.c. 10
	H.cl.	c.c. 2
	Sod. Fluorides	grs. 3
	Ag. ad	c.c. 1,000

The mixture is then thoroughly shaken and placed in an incubator at 37°. At the end of one hour, or thereby, the sputum is well broken up; and to it is then added an equal quantity of 4% NaOH. It is then replaced in the incubator, being shaken at/

at times until fluid, a half-hour is generally sufficient. Then a few drops of the following egg albumen solution is added I.E. 30 c.c. white of egg in 100c.c. of sterile water - the whole is now neutralised with normal Hcl. using litmus, and then stirred up for at least twenty minutes.

The purpose of the egg albumen is to prevent any floating bacilli.

With reference to the culture of the bacilli, if Tubercle Bacilli are seen on the film direct, their growth is easy by the anti-formin method of Griffiths, but if the bacilli can only be found on concentration, Dr. Munro considers that they can be cultured most readily on the following medium, viz:-

15% Glycerin meat extract, which is prepared thus:-

Take ½ lb. minced meat soaked in 250c.c. of 15% Glycerine in water and filter.

Then mix the following:-

a) 90 c.c. Glycerin meat filltrate plus 10c.c. of boiled milk.

b) 100 c.c. of egg (white and yolk) to which is added 1 c.c. of 1% Gentian Violet.

Now mix (a) and (b) and pour 4% into the required number of sterile tubes, which are then sloped and inspissated at 85°.

The following day the media in the test tubes is heated to 75°, and spread with the residue from the emulsification of the sputum./

sputum.

The growth should appear in from 14 to 21 days, and should grow tubercle bacilli from pus from abscesses and other surgical conditions.

We shall now pass to the consideration of three of the common symptoms of tuberculous disease, all of which may be present at an early stage independently of other signs. (1) Pleurisy, (2) Haemoptysis, (3) Cases marked by Bronchial Catarrh.

Pleural tuberculosis, frequently one of the first manifestations of active diesase in an adult, is generally masked in childhood, by the greater involvement of the chest glands. It is true that there is a substantial lymphatic drainage from the lung surface, not only to the glands directly, but also to the pleurae, most evident over the pulmonary apices, and it is probable that in certain instances tubercles scattered over the apical pleurae may develop synchronously with the glandular involvement. Similarly a tuberculous hydrops or adhesions between the two layers of pleurae may be the first abnormality to be detected. Here therefore we have a point of diagnostic importance, and we must be prepared to consider such a ideopathic pleurisy which occurs primarily and without coincident lung disease, as in all likelihood tuberculous in origin. In the very great majority of cases, however, the tuberculosis of the pleurae is overshadowed by the underlying lung disease.

Invasion/

Invasion of the pleurae may occur during the course of infection in the abdomen, either by direct spread and perforation, or through the lymph vessels which traverse the diaphragm. Caries in the spine or ribs are sources of pleural infection, and must not be overlooked, although they are unusual causes. The question of Haemoptysis as a diagnostic point need not detain us long. In the adult, expectoration of blood is a premonitory symptom of the very first importance, but in the young a true haemoptysis is an extremely rare occurrence. Some streaking of the bronchial secretions frequently occurs in children owing its origin to the presence of enlarged post-nasal and tonsilar lymphoid tissue, and when present is generally noticed in the morning immediately on rising; but a serious haemorrhage from a ruptured tubercular vessel or a pulmonary aneurism may for diagnostic purposes in children be disregarded. In rare cases in which there is considerable bronchial gland enlargement, pressure may be exerted to such an extent on the superior Vena cava, producing a venus stasis, and this reacting on the bronchial veins may give rise to a high degree of congestion of the mucosa of the bronchi, and lead to some haemorrhage from the respiratory trach. In such a case, after excluding cardiac disease, we should look to confirm our theory for other signs of venous obstruction.

It/

It will be generally agreed that in tuberculosis of the respiratory trach, a chronic cough is of all symptoms the most constant, and its clinical features are as a rule those of bronchitis. The cough may be slight or severe, but its chief characteristic is its persistence. It may be accompanied by other signs or it may appear and give rise to anxiety long before fever, wasting or physical signs in the chest lead to a positive diagnosis. In such a case, the disease begins gradually, and for some time is looked on as a simple bronchitis, and it is only when its intractable and persistent nature is revealed that we begin to question its simple origin and to look for other signs.

Diagnosis can only be made positively by the finding of the Tubercle Bacilli in the sputum, but as we have already shown in young children, this final test is difficult to carry out, and negative results with failure to find the bacillus frequently occur even in cases where the disease is progressing rapidly. How essential it is then that we should have resource to other conformatory tests which may put us in the track, and inform us that we are dealing with a tuberculous bronchitis. Then with the institution of fresh air, rest, good nursing and the other advantages of Sanatorium treatment, we may arrest the advancing disease and prevent what would otherwise be the end of such a case, caseating pneumonia or general tuberculosis.

Early/

Early signs noticeable by auscultation and percussion:-

The prominence of glandular infection in childhood and the fact that at an early stage of the disease, it is limited to the glands, causes us to imagine what physical signs shall we obtain on examination of the chest, and how can we elicit the information that the mediastural glands are enlarged. I shall quote from the description of the diagnosis of tuberculous mediastural glands given by Still in his book "Common Disorders of Childhood."

1.) Impairment of note in the 1st and 2nd intercostal spaces close to the sternum: this is of more value if it occur on the right side, for if it be only on the left, it may be normal, as there is often quite a finger's breadth of impaired note adjoining the sternum in the first left space, and still more in the second, presumably due to the large vessels passing up from the heart.

2.) Enlargement of veins, usually most noticeable in the second space, where one large vein is seen passing inwards from just below the coracoid process towards the inner end of the space: this sign is of value, chiefly when it is limited to one side of the chest; there are many thin-skinned children in whom a plexus of veins is normally visible all over the upper part of the chest. No importance can be attached to this.

3)/

3.) A bruit heard just below the inner end of the clavicle on extending the head as fully as possible with the child in the sitting or standing position. This sign which was first discovered by the late Dr. Eustace Smith, is regarded as the venous brim produced by the tilting forward of the lower end of the trachea with its adjoining glands, which are thus made to compress the left innominate vein. This sign, however, must be taken in conjunction with other symptoms, as it may be heard in cases of severe anaemia, where there is a "Bruit de Diable" in the neck, without anything to suggest tuberculosis or enlargement of mediastinal glands.

4.) A marked deficiency of air entry into some part of the lung. This is particularly characteristic if it involve a whole lobe. It is thought to indicate pressure on one of the bronchi.

5.) Dullness about the root of the lung in the interscapular space. This cannot be due directly to mediastinal glands, but points to consolidation of the lung near its root which occurs particularly when the glands which lie in contact with the earliest divisions of the bronchi are enlarged, as they usually are where those in the mediastinum are affected.

6.) Increased resistance on pressure over the manubrium is sometimes noticed when there is much enlargement of the mediastinal glands. This can be appreciated by steadying the child/

child by one hand placed behind against his upper dorsal spine, while the fingers of the other hand make intermittent pressure upon the manubrium. In the healthy child there is a well marked normal resilience, and one can detect a distinct diminution or loss of this in many cases of enlarged mediastinal glands.

7.) Rarely the upper rounded edge of one of the enlarged glands can be felt on pressing deeply with the finger downwards behind the upper part of the manubrium.

3.) The Tuberculin Tests. Pohl Pincus in 1884 first used the word Tuberculin, and he applied the name in a paper which he read in Berlin, to certain extracts of the tebercle bacillus by which a specific reaction could be produced in persons or animals infected by tuberculosis. R. Koch himself was, however, the first to explain that this so-called tuberculin reaction was a toxic process, accompanied by fever and general reaction; and that thus he saw in the administration of tuberculin in increasing doses, an active immunising and curative process.

In this country the adoption generally of tuberculin and its acceptance as a therapeutic agent was largely due to the researches of Wright in 1903, who showed that by tuberculin injections, bacteriolytic bodies were produced in the organism whose presence raised the immunity of the tuberculous animal and explains its immunity to re-infection.

From/

From what has just been said, it will at once be evident that this reaction to tuberculin by a tuberculous organism, readily paves the way to a method of diagnosis which will give some indication of tuberculous infection in early cases, before any other signs may be present, and for this specific purpose the following diagnostic tests have to be considered:-

1.) The Cutaneous.
2.) The Conjunctival.
3.) The Subcutaneous.

1.) The Cutaneous test, which was first described and practised by Von Pirquet, is according to McNeil, in the "British Medical Journal" of November 6th, 1909, best applied as follows:- A small circular area of epidermis the size of a pin's head, is chafed off with the point of a needle, care being taken to avoid bleeding. On this denuded area of corium the head of a darning needle charged with tuberculin is rotated in with gentle pressure. A small bruised pit is thus formed, from which the fluid is rapidly absorbed. The most satisfactory and trustworthy results are obtained from the use of the old undiluted tuberculin of Koch, although at first Von Pirquet employed a 25% dilution with ½% carbolic acid.

In my own series of cases, I found six which, while reacting definitely to the undiluted tuberculin, did not reach to the dilution which I had previously tried. It is well to employ a control test at the same time, and this is easily and satisfactorily done by treating a small area removed about an inch from the/

the site of the inoculation in the same manner with a drop of glycerine.

The most convenient and suitable place for the inoculation is the inner side of the front of the forearm, and obviously to avoid any chance of contamination it is best to make the control scar first.

The positive reaction varys in the time of its appearance from a few hours to several days, but as a general rule it is well developed and most easily distinguished from twenty-four to forty-eight hours after inoculation. Its extent and intensity also vary from a slight redness and hyperaemia , to a distinct papule, or in severe reactions even to vesication or ulceration.

It has been stated on good authority that the time taken before the appearance of a reaction is an indication of the severity of the tubercular infection. Those positive reactions appearing within twelve hours, and frequently accompanied by some fever and general symptoms, indicating a rapid and severe infection; while a slowly progressing redness with no local or constitutional disturbance may mean that although infection has occurred it is not in a progressive or active stage.

In my own tests, I have not found this to be so, as in cases 39, 27 and 17, in which undoubted active tuberculosis was present, the reaction did not appear until after twelve hours. The/

The persisting reaction is characterised by a slow appearance, and generally reaches its highest intensity about the end of the second day at which stage it continues for several days, then gradually dies away. I have observed in all nine cases which can well be ascribed to this category (cases:- 42, 26 - 20 - 11 - 31 - 10 - 7 - 39 - 34) This type is supposed to occur in patients who are infected but who have inactive lesions. (Hamman and Wolman - Tuberculin in diagnosis and treatment) and from the type of child in whom I observed its occurrence, this would appear a likely explanation.

There is a type of reaction described by many authors, which occurs in weakly and scrofulous children, with chronic blepharitis, nasal discharge and other stigmata, and which leads to ulceration, and is long in healing; the skin about the area of reaction being often raised in numerous small nodules. The nodules are pathologically of the nature of tuberculides. This reaction I have not seen, although many of my cases were children in a decidedly weak and wasted condition.

A negative reaction may be defined as one in which there is no appreciable difference to the sight or touch, between the inoculation site and the control for a period of seven days, and this occurred in fifteen of my cases; of this number fourteen were below the age of three years, (cases:- 36 - 33 - 4 - 1 - 9 - 14 - 15 - 45 - 43 - 41 - 28 - 19 - 24 - 25) This negative result as a whole speaks for the absence of tuberculous infection/

tion; but occasionally this is the result in spite of the presence of certain and undoubted tubercular manifestations capable of clinical demonstration.

In cases of advanced general tuberculosis or tubercular meningitis, the reaction is generally negative as also in cases complicated by acute specific fevers e.g., Measles, Diptheria, Scarlet Fever and other acute infections such as Pneumonia. The theory propounded by Von Pirquet is that in such cases i.e., patients who have tuberculosis synchronising with an acute infectious fever; the absence of the cutaneous reaction to tuberculin, is due to the absorption of the Ergius (the bodies which bring about the chemical reaction between the tuberculin and the cells.) He states that "considered in this light the decrease in the tubercular Allergia during measles is brought into harmony with the fact that in connection with the disease there so often occurs a dissemination of the tubercular focus."

In pregnancy also there is a non-appearance of the reaction, and in the same way Stern explains this by the fixation of the anti-bodies to the lipoids of the placenta, with as a result, the unfavourable effect of a pregnancy on a tuberculous patient. The cutaneous tuberculin reaction frequently, indeed one might say regularly, fails, in the last days of a person dying from the disease. The reacting power of the patient has become non-existent. This doctrine that the test fails in advanced and widespread disease and has been accepted by all investigators, early/

early and recent: but as recently as April 21st, 1923, in the "British Medical Journal" of that date, a very interesting article by McNeil appears in which he revises his previous opinions on this point, and he alleges that with improved and more minute technique, positive reactions may be obtained even in the most advanced cases of the disease in children. He states that with his own technique (that which I have already described), a positive reaction will be obtained in any case of tuberculous meningitis, acute miliary tuberculosis, massive abdominal tuberculosis and acute pulmonary phthisis.

I can corroborate this view by reference to cases 19 - 37 - 45 - 29 - 51 - 34, all of which gave a positive reaction, and in all, the tuberculosis was very far advanced and all died within a few weeks of the test, the exact time, however, I am unable now to determine. In none, however, did a longer period than five weeks elapse between the application of the Von Pirquet test, and the child's death. Before leaving the cutaneous test it is necessary to refer to the quantitative test, the technique of which has been supplied by Morland, and in which by means of a series of dilutions of tuberculin of varying strengths an attempt is made to determine the skin sensitiveness of the patient, and thus to estimate the activity of the disease. This method is as yet subject to many falacies, and to meet them much experimental/

experimental investigation is still required. Morland says, ("Early Diagnosis of Tubercle.") that in this method we are dealing with probabilities of a certain value only, and as such they are links in the chain and no more.

The Peri-cutaneous test of Morro is carried out by Old Tuberculin in a 6% suspension in lanolin. A pea-sized piece of the ointment is thoroughly rubbed into the skin for one minute over an area of 5 cm. in diameter. In positive reactions an efflorescence of small papules occurs in from twelve to forty-eight hours upon the annointed area. Morro describes the varying reactions under the headings - Mild, Moderate and Severe, and according to his and other figures, its reliability is on a par with Von Pirquet's test, but is somewhat less sensitive. Its only advantage would be in cases where scarification is objected to by the child's parents.

2.) The Conjunctival test is also known as Calmette's test, who first introduced adopting for its use a special preparation of tuberculin of his own. As a means of diagnosis this test has now fallen somewhat into disuse, not so much from any unreliability, but more on account of the disasterous results which have frequently been stated to follow its application. Those fears appear to be greatly exaggerated. Calmette himself in six hundred odd tests, had only three cases of conjunctivitis, and it is now evident that if a weaker solution be employed, namely, 1% Old Tuberculin, the dangers are practically negligible.

According/

According to Claud Riviere, the precautions necessary in the use of the test are the exclusion of all cases in which there are evidences of past or former eye disease, and the avoidance of re-installation in the same eye, and also the exclusion of weakly children and the aged.

The technique of the test is as follows:- A drop of the solution is placed with an eye dropper at the inner end of the lower lid, and allowed to flow round the lid and the eye. At the expiry of twenty-four hours, the eye is examined and compared with the other eye.

The results of this test are well summarised by Riviere in his book - "The Early Diagnosis of Tubercle," in which he states that a positive result is of some value as evidence of active disease, but a negative result in no way precludes this.

3.) The Subcutaneous test is the test "par excellence" when no contra indications to its employment exist. It is the most certain in its results and the most simple and accurate in its interpretation.

In individuals who are infected by tuberculosis this test is almost invariably followed by one or other or all of the three following reactions.

a) A constitutional reaction with fever, malaise, severe headache, etc.

b) A local reaction consisting of redness and swelling, varying greatly in degree at the site of inoculation.

c)/

c) A focal reaction which implies an exacerbation and inflammatory reaction in the focus of the tubercular disease.

Unfortunately on account of this focal reaction and the possibility of increasing the activity and violence of the disease, the subcutaneous test must always be done with extreme care and caution. Gittings in America goes so far as to recommend that it should never be employed in children, except in rare instances; and with this, one would be inclined to agree, as there are other tests and methods of application of tuberculin which are perfectly safe, and equal to the subcutaneous test in value in the young.

Bandelier and Ropke, however, do not condemn the method to anything like this extent, and they ascribe serious results nearly always to carelessness or ignorance. Claud Riviere, while he states that he has had cause to observe several lamentable examples, illustrates that the latter have been in all cases, due to neglect to follow the simple rules laid down for the administration of tuberculin.

The chief of these contra-indications are:-

1) Fever. Koch wrote, "Patients with a temperature over 98.6 F. in the axilla, are unsuitable for the diagnostic administration of tuberculin." And Riviere states that if this rule had been more rigidly observed, few, if any, of the accidents recorded in literature would have been observed.

2)/

2) Obvious phthisis - in which cases the diagnostic test is not required and should not be done.

3) Recent haemoptysis or recent severe illness, e.g., nephritis, diabetes, eplepsy, or a suspicion of milliary tuberculosis.

The series of fifty-one cases in which I investigated the Von Pirquet test, occurred in children which I have observed during a period of two years. The children examined were taken more or less hap-hazard, as probable victims at some time or another of tubercular infection.

The Von Pirquet tests were done in the manner already described, namely, McNeil's method, and were examined at intervals of twelve, twenty-four, forty-eight and seventy-two hours. The usual type of reaction was found to be just appreciable in about twelve hours' time; to be most marked at forty-eight hours, and to be quite definitely fading in seventy-two hours. The types which are classified under the term, persistent, are those reactions which had not appreciably lessened by this later period, and continued well marked for a week or more.

As I have previously stated, fifteen tests were definitely negative, and in all of them their symptoms were discovered to be due to some other condition, and in all but one, their subsequent history was that of rapid improvement with suitable treatment, and thoroughly substantiated a negative diagnosis of tuberculosis/

erculosis. In the single exception, namely, case 25, an acute broncho-pneumonia was the end, but no evidence of tubercle ever developed. Furthermore, in six of those cases which were negative to the Von Pirquet test, an X-Ray examination was made and each radiogram confirmed the preceeding test, and showed no abnormal thoracic shadows, or other signs of incipient tuberculosis in the chest.

4) The Laboratory Tests:-

1) The Opsonic Index:- no details of the Opsonic method are required for this thesis, and as this method of diagnosis has been now practically abandoned the subject may be dismissed very briefly. It will be sufficient to state that the test aims at obtaining a diagnosis by determining whether there be present in the blood stream, an attempt at an auto-inoculation with an auto-tuberculin. Up to the present there has been great diversity in the results obtained, due to the extreme difficulty in the avoidance of experimental error, and it is on account of this error that the opsonic index has fallen so greatly into disuse.

3) The Complement fixation test.

This test is associated with the name of Besredka, who in 1913, while working on the lines of the Wassermann reaction for syphilis, introduced a special anti-gen prepared from/

from growths of tubercle bacilli in a medium of veal broth and white and yolk of egg, the broth being filtered free of bacilli after three weeks' growth. With the use of this antigen, Besredka found that out of 750 persons, 69 were positive to his tubercular antigen; 53 of those positive cases were submitted to careful examination, and 41 were found to be definitely tuberculous. (Riviere- "Early Diagnosis of Tubercle")

Besredka sums up his results and states that in the first stage of tuberculosis, the fixation reaction is always positive, in the second stage, the reaction is positive in the great majority of cases, and in the third stage, the reaction is usually negative. Others have obtained somewhat similar results, and Riviere concludes "that a positive reaction in a case of doubtful disease with symptoms, appears to be good evidence that active tuberculous foci are present, and in the absence of symptoms we may be only dealing with arrested or healed tuberculosis."

A negative reaction he considers to be less valuable as in very early cases the method is liable to failure. But taken all in all, it appears that the test as used in its most modern form, is capable of supplying us with very useful probabilities.

5.) Radiography.

The discovery of Roëntgen in 1896, is one of the most notable landmarks in the history of medicine. More particularly has this been evident during the last decade, when, as a result of unproved technique, and more efficient apparatus, the use of X-Rays has be.come/

become steadily more indispensable in the pursuit of medicine and surgery.

The Radiographer of the present day is no longer in the obscure position of a mechanic who takes a photograph and leaves its interpretation to others: he is now for the most part, a medical man, experienced not only in his own radiographic work, but also in the pathology and clinical features of the lesions he demonstrates.

It has now been shown that we have in the X-Rays an instrument capable of giving the greatest assistance in determining the various pathological conditions of the lungs and the position of the expert radiologist is essentially that of a consultant. It follows therefore that in a case in which a suspicion of lung disease is raised, a physician who does not obtain radiographic assistance fails but little less in his duty than a surgeon who neglects to X-ray a bone or joint abnormality. The following broad considerations in the radiography of the chest have been stated by Lawson in the "Practitioner" of Jan., 1913, and are quoted somewhat briefly:-

1. A healthy lung and pleura offers no obstruction to X-rays. The appearance under the X-rays is therefore one of dark shadows corresponding to the ribs and separated by clear spaces.

2./

2. Excess of air in the lung or pleura corresponds to an abnormal degree of lightness in the intercostal spaces.

3. Diminution of air in the lung causes the organ more or less to solidify, and this corresponds to a deep shadow on the screen or skiagram.

4. Variations of the lung content of air affect the position of, (a) the heart, (b) the overlying ribs. The width of the intercostal spaces which separate the latter from one another may be increased by the presence of excess air in the lung or pleura; on the contrary the size of those spaces may become diminished, and the ribs tend to approximate - a condition described as roof tiling, where contraction or collapse of the lung is present.

5. Fluid in the pleural sac obstructs the rays and is represented by a shadow the depth of which varies with the density of the fluid.

From what has been stated above it will be seen that in advanced disease with gross changes in the chest or in the lungs themselves, the recognition of the lesions is greatly enhanced by this means, and such conditions as pneumothorax, pleural effusion, cavity formation and bronchieitasus, are easily distinguished. We are now, however, with out increased knowledge and greater control of the X-Rays, in a position, not merely to verify gross changes, but even to demonstrate and to localise early changes and pathological occurrences in the lungs, and - what is more important in early cases of tuberculosis - enlargement of the/

the thoracic glands.

As has already been stated emphatically, the bronchial glands form the chief anatomical soil for the seeds of tuberculosis and are the main site of infection during the first decade or so of life. The general topography of those important gland structures may be divided into three groups:- (a) Mediastinal, (b) Hilar and (c) Peri-hilar, (Overend - "The Radiography of the Chest") The mediastinal group are again sub-divisable into Tracheo-bronchial and the Bifurcation glands. These various groups of glands may all be affected simply, or as a whole, and when enlarged, inflamed or caseous, they give rise to radiographic opacities, which vary in the density of their shadows, according to the stage of the tubercular infection, the greatest density being shown when calcification takes place. In the cases I have examined, I have endeavoured to estimate the value of a radiogram in early infections with the tubercle bacillus, and in all my cases the antro-posterior position has been the one adopted, with the patient lying on his face, and the plate on the dorsum. This position gives a good view of all the glands, except those at the bifurcation, which are somewhat obscured by the base of the heart and great vessels. To obtain the most satisfactory view of the bifurcation glands the oblique diameter of the chest is required, and this I found very difficult to obtain satisfactorily in young children. Moreover, undoubtedly the best results in chest radiography are to be obtained with the Coolidge tube and an instantaneous/

taneous exposure, which unfortunately was not available; but in spite of this, from the small series of cases which I have radiographed, it will be seen that even by these older methods many valuable indications may be obtained as to the probability of glandular infections in the chest. It is further worthy of note that children are particularly suitable for this method of examination, owing to the easy penetration of the bony and muscular structures by the X-Rays. As Hochsinger points out, however, (Pflaunder and Schlossmann's "Diseases of Children") special care is required in the interpretation of radiographic work in young children, for the shadow of the heart in infancy offers special pecularities owing to the proximity of the heart to the thymus and the relatively high position of the diaphragm.

Thirty-two cases were examined radiographically, and of those nineteen showed evidence more or less definite, of glandular involvement and subsequent shadows in the thorax, and as all of these positive results, on X-Ray examination had also given the cutaneous tuberculin reaction, a definite diagnosis of tuberculosis was firmly established.

Regional Diagnosis.

1. Tuberculosis of the intra-thoracic glands. This has already been dealt with at some length, but here it is necessary to state that within the last few months some modification of the theories with regard to the mode of infection has occurred. Ghon has given as his view, and that he now believes that the primary focus is in the lung tissue itself, and from thence the infection may settle for a varying period in the adjacent glands. This point he seeks to establish by the fact that bacilli may be obtained by the use of various concentration tests, even in the earliest of infections, and before there is any glandular disorginasation or enlargement. The X-Ray examination of the chest, a method of the first importance in diagnosing tubercular thoracic glands, has already been considered as also have the various physical signs met with on Ausculatation and percussion. One must, however, mention the so-called Dr. Espiné's sign as being one of the most reliable indications of bronchial gland enlargement. This sign is elicited as follows:- With the patient standing/

standing, the head flexed, and the arms folded, the examiner auscultates over the trachea behind at the level of the sixth or seventh cervical spine: and here the characteristic tracheal bronchophony, persisting a fraction of a second after the voice has stopped, is well heard. Below the level of the seventh cervical spine in children this peculiar postphonal quality is lost; but as noted by Dr. Espiné, in the presence of enlarged glands or tumours this tracheal sound could be heard at least two vertebra lower down.

If the glands are large enough we may get pressure symptoms produced which will vary according to whether vessels, nerves or bronchi are affected. Of these the most important are, dyspnoca without acute infection of the respiratory tract, brassy cough and cyanosis, without cardiac disease. In this stage of glandular enlargement in the differential diagnosis the special conditions to be considered are Thymic enlargement, Hodgkins disease, Mediastinal syphilis or tumour. In an article by Munro in the "Lancet" 1922 II, 1376, syphilis of the lung is described as"not an infrequent pathological condition in congenital forms of syphilis," and should be differentiated by the Wassermann test, and by one or other of the tuberculin reactions.

The signs of spread of tuberculous bronchial glands, will depend on the concomitant lung disease, which will dominate the picture/

picture, or in rarer cases the result of a rapid gland disintegration may be a miliary tuberculosis or a meningitis, as in most instances of such terminations old and advanced lesions of the bronchial glands are seen.

2. Surgical Tuberculosis. This term means 'prima facie' those types of tubercular infection which may be amenable to surgical treatment, i.e. cases where the infection is more or less localised and in which there is a probability of the removal by surgical measures of the focus of infection, or cases where local treatment is necessary, which is generally summed up by the word, rest. The term is, however, an unfortunate one, as in no case of tuberculosis are surgical measures sufficient to allow us to neglect the general and hygenic treatment.

In cases of surgical tuberculosis, bone and joint lesions are of the first importance. It is obvious from what has been previously stated, regarding the morbid anatomy of tuberculosis in general, that the tubercle bacilli lodging in the cervical, bronchial and mesenteric glands, may lead there a peaceful and frequently overlooked existence. But if all does not go well, and there is established in the body a 'locus ruinovis resistentiae' bacilli may reach this area, find a suitable soil for their growth, and there thrive afresh, giving rise to the local bone and joint lesions, and to general signs of tuberculous toxaemia. The common situations which favour the development of bone and joint tuberculosis, are those in which lymphoid cells predominate/

predominate; and we find that this occurs in the cancellus ends of long bones, in the marrow cells of the carpus and tarsus, but also in the synovial lining of the joints.

Thus we see that in a child who exhibits bone or joint tubercular lesions there is also almost certainly a primary focus elsewhere.

Furthermore, we find that the location of the bone infection is almost always determined by some previous injury, and that a history of trauma, frequently comparatively slight preceeds the development of symptoms of tuberculous disease. In the diagnosis of these types of tuberculosis, pain is as a rule the symptom which has been and is the most prominent; especially in disease of the vertebral column or hip joint when the pain is referred respectively to the abdomen or knee.

The clinical diagnosis from the physical examination in such cases, is generally easy, but apart from this, the other scientific aids must be employed as confirmatory tests. Radiography here is of the greatest value, and the characteristic appearance of bone atrophy, rarefaction and later destruction, make it easy for a positive diagnosis to be made. In some instances, however, it is impossible to distinguish the bone changes due to tuberculosis, from those which are due to other slowly developing lesions - notably cysts of bone, syphilitic disease, or even sarcomata. Syphilis may be excluded by the use of the Wassermann/

Wassermann test, and tuberculous disease may be distinguished from these other maladies by the Von Pirquet test, or by the percutaneous inoculation.

I may mention here case (51). A young child who was sent to hospital with a history that he had hurt his ankle some six weeks previously, and it was not improving. A very definite Von Pirquet test was obtained and the case was diagnosed as one of tubercular disease of the tarsus, although on first X-raying the foot, no bony changes were evident, probably as at this period the soft parts, synoria and cartilage, were only affected. The boy died after lying a month in hospital from typical tuberculous meningitis.

Lastly examination of and cultures from the pus from a tuberculous abscess may and frequently does give a growth of the bacilli which is positive evidence of such certainty that the method is strongly to be advocated when possible. Another type of surgical tuberculosis is tuberculosis of the skin, eminently a disease of childhood, and one in which the diagnosis is somewhat empirical and not always to be made with exactness.

Tuberculosis of the skin is divided into those cases caused directly by the resultant action of the tubercle bacillus infecting the skin, and those in which the skin is infected secondarily from the action of tuberculous toxins circulating in the blood.

The following classification of tuberculosis of the skin is/

is given by E. Norman Meachen, in "Tuberculosis in Children," Kellynack, page 149:-

A.) Those due to the presence of the tubercle bacillus:- Lupus vulgaris, Scrofulodirmia, Tuberculosis cutis (miliary), Tuberculosis verncosasutis, Erythema in durata scrofulosorum (Bazin), Lichen scrofulosorum.

B.) Those affections not directly due to the tubercle bacillus and which have been described as "Tuberculides" (Darier) or Para-tuberculoses, (Johnstone):- Lupus erythematosus, acne scrofulosorum, acnitis, and the small pustular tuberculide.

It is necessary to discuss these various skin manifestations of tuberculosis seriatim.

Lupus vulgaris is by far the commonest form of cutaneous tubercular lesion met with in children. Lequeira states that in all his cases 58% occurred before the tenth year of life. Its diagnosis is generally fairly straightforward; it has to be differentiated chiefly in young children from tubercular syphiloderm, and for this reason a Wassermann test is strongly to be urged, giving as it does a very valuable indication as to future treatment, and further, in suspicious skin lesions the spirocheta-palida should invariably be searched for to establish or eliminate the diagnosis of a syphilitic initial lesion.

In lupus as in other forms of tuberculosis, the tuberculin tests are all strongly positive, and help to clinch the diagnosis in cases of doubt.

Case/

Case No. (23) was suggestive of syphilis as the appearance of the dermatitis and its situation were rather against lupus. A negative Wassermann test and a strongly positive Von Pirquet together with failure to improve with Iodides, settled the question; and rendered a diagnosis of a tubercular infection easy to arrive at.

Scrofuloderma is easily distinguished on account of the preceding glandular tuberculosis, and little need be said on this subject, beyond noting the fact that the disease is not infrequently associated with lupus.

3. Abdominal Tuberculosis. In speaking of this, it must be understood that what is meant is infection either primarily or secondarily of the intestines, the peritoneum, or the mesenteric glands: the symptoms predominating according to the measure of involvment of these various structures.

The situation is comparable to the chest in that the infective process may be held up over varying periods in the glandular masses.

The discussion as to the frequency of the bovine type of bacillus in the production of abdominal tuberculosis does not enter the scope of this thesis, but we may conclude that primary abdominal tuberculosis is due to the ingestion of infected milk.

Tuberculosis of the intestines with ulceration and haemorrhage is generally secondary to lung disease and due to the ingested/

ingested sputum. The typical symptoms are diarrhoea, abdominal pain and blood and pus in the stools, and the difficulties in diagnosing such a case from one of non-tuberculous entiritis are very great, but a positive Von Pirquet reaction and the presence of tuberculosis elsewhere will affirm a diagnosis of tubercle. The diagnostic value of skiagraphy in defining tuberculous ulcers, has, in children at any rate, not been so far satisfactory. Tuberculosis of the peritoneum in the typical case with fluid formation or dry filmous masses are easy of diagnosis, but in the early stages, when perhaps there is only some evidence of indigestion, or some evanescent abdominal pain with loss of weight, a definite diagnosis by clinical means alone is a matter of the greatest difficulty and uncertainty. I have within the last two years observed three cases which were operated on under the diagnosis of acute appendicitis, and which on laparotomy, turned out to be the acute onset of a peritonitis due to the rupture of a caseous retro-peritoneal gland situated near the lower limit of the mesenteric attachment. Two of those cases were young girls of school age, and the third was a young woman, the aunt of one of the previous cases. They all made a very satisfactory recovery, and have no signs at present of a recrudescence of the abdominal symptoms or infection.

Typhoid fever is another pitfall, and it is well to remember that it may be simulated by tuberculous peritonitis, and in/

in such suspicious cases, the Widal and the tuberculin tests should both be investigated, although the findings of the latter where there are pronounced toxic symptoms are merely suggestive in such cases.

In infancy and after the first year of life, rickets is the most common condition to simulate tuberculous infection, especially of the peritoneal cavity, owing to the protuberant abdomen it develops. The tuberculin test is of the greatest value here; as in the absence of an active tubercular infection, the test will definitely be negative, and not obscured by a previous and latent tuberculosis.

4. Miliary tuberculosis. This form of tuberculosis when acute is always secondary to some pre-existing focus, its pathology consists in the simultaneous infection of several organs with the resulting formation of the miliary tubercles in such numbers as to produce a fatal systemic infection before the actual infective processes have had time to produce local lesions beyond the miliary stage.

What is termed general tuberculosis on the other hand, is the condition of general tubercular infection in which the various lesions have advanced beyond the tubercle stage, and the symptoms are dominated by signs of disease in the structures most seriously involved. It will therefore be clearly seen that the early symptoms of miliary tuberculosis are due to general toxaemia, and that symptoms owing their existence to interfer-

ence/

ence with the specific function of the various organs involved may, in fatal cases, not be seen at all.

From the point of view of diagnosis, those toxic symptoms differ little from those already described as characteristic of any tuberculous toxaemia. Their production is, however, much more rapid, their effects much more marked, and their results much more definitely certain. Rapid loss of weight and grave asthenia which progress more rapidly as the disease advances, may produce a fatal termination without any other sign or symptom.

If, however, focal symptoms are given time to develop, they may be classified as to whether they involve:-

1. The brain and meninges.
2. The lungs.
3. The abdominal organs.

1. <u>The brain and meninges</u>.

In early childhood the onset of tubercular meningitis is frequently the first sign that the disease has become generalised.

Gittings states ("Tuberculosis in Childhood") that among 410 cases of tuberculous meningitis observed by Holt, 3 were three months to one year, 149 from one to two years, 76 from two to five years, 17 from five to nine years, and 6 from nine to sixteen years. Almost 76% therefore occurred in the first two years of life.

Three/

Three of my cases died from tuberculous meningitis (cases 13, 34, 51) their ages at death being, five years and four months, one year and five months, and three years and six months, all of them were seen and examined before any meningeal symptoms developed, and all of them gave a positive Von Pirquet reaction.

Two were also examined by radiography, and showed definite chest gland involvement. To enter into the signs and symptoms of meningitis would be superfluous here, but the point I wish to remark on, is the difficulty and frequently the impossibility of making a diagnosis in the early stage and in cases of gradual onset; and I merely impress the importance of an early resort to the scientific tests in cases where suspicion is aroused.

The skin reaction is easy and simple to carry out, and gives an excellent and reliable indication and when positive should at once lead to the employment of the most direct diagnostic method for meningitis, namely lumbar puncture, with examination of the cerebro-spinal fluid for tubercle bacilli.

2. <u>The lungs</u>.

As is well known acute miliary tuberculosis of the lungs is most rapidly fatal. The clinical picture is one of acute pneumonia, but on examination of the chest, the physical signs are wanting.

In case No. 4., although no post-mortem examination was made/

made, I think the diagnosis was one of acute miliary tuberculosis of the lungs, in spite of the fact that no tubercle bacilli were obtained in three tests of the sputum.

The child was too ill for X-ray examination, but the Von Pirquet test was very rapidly and strongly positive, and I think the case is interesting and instructive from that point.

Case 37 is an instance of a general tuberculosis, with prominent lung symptoms and evidence that the disease had progressed beyond the tubercle stage, with acute tubercular bronchopneumonia supervening. This child also gave a positive Von Pirquet. Again in case 45, a positive Von Pirquet was obtained by McNeil's method although the disease was in its last stage, and the child dying when the test was made.

3. The Abdominal Organs.

Acute miliary tuberculosis occurring in the abdomen is rare, and it is impossible to differentiate it, as such, during life, but under this heading may be mentioned a type known as the "typhoid form" of miliary tuberculosis, in which the spleen is usually enlarged, and abdominal symptoms notably distension, occur. The differiential diagnosis from enteric fever is obtained by the Widal reaction, rose spots and the examination of the eyes and other organs for signs of tuberculosis. The employment of X-rays should strongly be urged in those cases if possible/

possible, as a definite finding in the chest of latent or active mediastinal tuberculosis, would materially assist the diagnosis and treatment.

The "Marantic" form of miliary tuberculosis occurs in infants and is so called, as during the course of the disease the only noticeable symptoms are loss of flesh and exhaustion. Case No. 7, I think comes under this category, no physical signs could be obtained, although the X-rays showed undoubted signs of advanced gland disease. The Von Pirquet test gave a rather doubtful positive reaction and, but for the picture obtained on X-ray examination, one would have been quite at a loss to account for so much wasting and unable with scientific accuracy to decide on tuberculosis as the cause.

Treatment.

1. Prophylactic.

It is only within the last two decades that the question of prevention and arrest of tuberculosis in children has received serious consideration in this and other countries.

As our knowledge grew concerning the sources of infection of the disease, it has gradually become an established fact that tuberculosis is a preventable disease, and if discovered early it is very eminently curable. The uncertainty of diagnosis in early cases is the main difficulty, and frequently the disease has made considerable headway before it is recognised, and active prophylactic measures instituted. The arresting figures of Dr. Newsholme taken from the Great Ormond Street Children's Hospital for 1877, ("The Prevention of Tuberculosis" London, 1908) are well worth recording. Those figures show that out of 77 deaths from all causes 35.5% were due to tuberculosis, and he considers in the same report that one third of the deaths under ten years of age, are due to tuberculosis.

Dr./

Dr. Newsholme also states ("Tuberculosis in Children" - Kellynack) that the proportion of children in elementary schools with revealed phthisis appears to be in Edingurgh 1 in 69 - in Aberdeen 1 in 200, and in Brighton 1 in 296. He agrees therefore that a much larger proportion though not manifestly suffering from tuberculosis, are markedly predisposed thereto, and therefore stand in need of energetic anti-tuberculosis management.

Since the above figures were given, modern methods of diagnosis have advanced vastly, and therefore it will readily be agreed that their early employment enters very largely indeed into the question of prophylactic treatment. Radiography is one of the most reliable means of verifying a suspicion of bronchial gland tuberculosis. Many authorities, notably Turban, Walsham and Hochsinger all point out the usefulness of this measure.

The various tuberculin tests which have been described in previous sections of this paper - notably the Von Pirquet and the percutaneous test - are all of great diagnostic service and should be regularly employed by those properly trained in their usage as general measures of weeding out those children suspected of harbouring an early infection.

It is also very desirable that the Holt method of collecting the sputum and the testing of this by the concentration of the bacilli, if present, should be resorted to on all possible occasions/

asions, and arrangements by which this can be carried out with facility in all neighbourhoods should strongly be urged.

In all civilised communities an increasingly active warfare has been waged during the last twenty years against the scourge of tuberculosis and nowhere with greater thoroughness than in Great Britain.

The question of the compulsory notification of the disease had been frequently and at varying intervals, suggested to the Government, but for long those persuasions were in vain, the liberty of the British subject was too serious a matter to interfere with in this way. It was not until it had been emphasised most strongly that tuberculosis in a patient educated in the means of preventing its spread, need no longer be an infectious disease and that early recognition and treatment of the disease by proper means will often arrest or even cure it completely. What is required therefore, is early detection, first and foremost, and following on that, its careful treatment by the proper measures, and its spread to others prevented.

Parliamentary legislation with regard to tuberculosis first came into force on Jan. 1, 1909, (Public Health, Tuberculosis Regulations, 1908) which Order made Pulmonary Tuberculosis occurring in all Poor Law patients compulsorily notifiable. This measure met with so much success, dealing as it did with a field which covered a wide area of the total tuberculosis existing/

ing, that the Local Government Board, urged by both expert and general advice, issued the 1911 Regulations which came into force on May 1st, 1911, and provided for the compulsory notification of all Hospital patients suffering from tuberculosis, including those attending Dispensaries and other institutions (other than those of the Poor Law). Immediately following on this came the third set, coming into force on Jan. 1st, 1912, making all persons suffering from the disease compulsorily notifiable.

A further procedure which might be urged and which I have attempted to justify in this thesis is the notification and observation of suspected cases. As I have pointed out in the preceding pages, the difficulties of early diagnosis are very great, and cannot be overcome without great care and the expenditure of much time. In addition there is the necessity of special laboratory facilities, and the material for scientific research, together with radiographic aparatus of most recent type. The general medical practitioner who invariably is the first to observe such early cases under the present limited regulations, has no means whereby he may verify his suspicions. Naturally he is unwilling to suggest or to voice the word tuberculosis, which is now as dreaded in its new acceptation as the consumption of old, and he waits to see whether something may turn up which will justify such a diagnosis, and unfortunately in the waiting/

waiting the time is frequently lost when the greatest benefit would be obtained from treatment and prevention.

The National Health Insurance Act of 1911, which came into force on Jan 1, 1912, is at the moment the subject of heated controversy. Many amendments will be necessary before as a smoothly working measure it gives satisfaction to the various interests it impinges on. Nevertheless its underlying principles in the interests of Public Health, are such as no one can gainsay. The "benefits" under the Act that touch the question of tuberculosis, are the so-called Sanatorium and the Sickness Benefit. The effects of Sanatorium Benefit were soon seen to be far-reaching, but as constituted, the basis of the Act was too limited, and its benefits restricted to too small a section of the population. The persons who benefit most materially from early sanatorium treatment, are the young, and it was seen to be unreasonable that this type of treatment and benefit under the National Health Act should be restricted to persons over sixteen years of age.

In September, 1920, therefore, Sanatorium Benefit ceased to be part of the Health Insurance Scheme, and its responsibility devolved upon the various Local Authorities. Upon those Local Authorities working with the Ministry of Health and the Scottish Board of Health, the anti-tuberculosis administration rests at present.

The/

The "Medical" benefit of the National Health Insurance Act does not deal with tuberculosis, except in so far as it enhances the early detection of tuberculous disease, by insuring to the poorer population early and skilled medical attention. In this respect it is again evident that those persons to whom early recognition of the disease would be of most benefit, do not come within the cordon of the Act; and in future legislation, if proceeding on the same lines, it would be necessary by extending the Regulations, to include the families and dependants of the insured population.

At present this defect in the comprehensiveness of the National Insurance Act is to a large extent minimised by the appointment of the local School Medical Officers, which ensures that children of school age are kept under an observant eye. The School Medical Officer works under the administration of the Medical Officer of Health for the town or county, and in close co-operation with the local Tuberculosis Officer, the latter a whole-time Medical Officer, is also a unit in the health administration of the district and appointed by the local Health Authority from amongst young medical practitioners specially versed in the detection of incipient tuberculosis. So important has this question become that in practically all the medical centres and teaching bodies, a special course of study on tuberculosis/

tuberculosis with a qualifying examination is insisted on before a medical qualification can be granted.

In the district in which I practise, a rapidly growing mining and industrial area, the Medical Officer of Health for the County directs the scheme for the detection and treatment of tuberculosis, assisted by a Deputy Medical Officer of Health and a Tuberculosis Officer. In addition several of the larger County Burghs have appointed part-time Medical Officers who are also engaged in general medical practice. A practitioner on diagnosing a case as one of tuberculosis, is required to notify immediately the Medical Officer of Health for the County, or, if within the area of a Burgh in which a local Medical Officer is appointed, the notification is sent to him in the first place, and subsequently forwarded to the county headquarters. The case is then visited by the Tuberculosis Officer who reports as to the advisability or otherwise of sanatorium treatment.

The Sanatorium approved by the Scottish Board of Health is situated at Glenlomond on the borders of Fife and Kinross at the foot of the Lomond hills. It is under the direction of the Fife and Kinross Joint Sanatorium Board, and is rate supported. Accommodation is provided for 154 patients, and in September, 1922, a special hut for the use of children suffering from surgical tuberculosis was opened. This hut can accommodate sixteen children, and has, I am informed by Dr. Munro, the Medical Superintendent/

Superintendent, been of inestimable service in the treatment of those cases.

The Sanatorium is well equipped with laboratory apparatus and every facility is given to research work, but a serious handicap is the want of an X-Ray installation. The question of providing this is at present being urged, and cannot afford to be ignored.

The Kirkcaldy Sanatorium for Consumption belongs to the Burgh Corporation, and has accommodation for fourteen cases of pulmonary tuberculosis occurring withing the burgh. The early detection of pulmonary tuberculosis is seen therefore to fall on the general practitioner, but he is assisted in the case of infants by the various child welfare centres which are instituted throughout the county, and to which mothers are encouraged to take their children. Those welfare centres are supervised by a medical man in practice in the neighbourhood, and have each a competent nurse, who is experienced in the care and treatment of children. The children are examined weekly or oftener if necessary, and regularly weighted, and cases of malnutrition investigated.

All school children attending the board schools are periodically examined by the School Medical Officers, who report suspicious cases to the child's parents, and also give an intimation to the family doctor.

It/

It will thus be seen that in the working of the Public Health Acts, a very wholehearted attempt is being introduced to detect the early beginnings of ill health in childhood, and this applies particularly to tuberculosis, and to the various minor defects which predispose to infection by this disease.

At the same time efforts are being made to educate the parents in methods of prevention and also to instal a more healthy regime into the lives of growing boys and girls. In the schools more time is devoted to hygiene, and healthy out-door exercise is encouraged as far as possible. Much might be done that is not feasible at present, and the financial question is one of paramount importance; but health legislation has come to stay, and the present day tendency is for State control to increase rather than diminish.

It would be well therefore, not only for those directly interested, but for all classes to study to some extent these questions, to understand and to have a clear mental picture of the ends aimed at, and of the methods by which their attainment is possible. Thus the time and money spent will be utilised to the best advantage, and will give to the population in the future a clear gain over one of the present great scourges of humanity.

Summary and Conclusions.

The early diagnosis of tuberculous disease is a matter of paramount importance, as it is only by attacking the disease at its beginnings that really hopeful results may be expected from treatment, and further, it is only by catching those early cases, and deciding on their tuberculous nature, that careful observation can be instituted and the prevention of the disease and its spread to others successfully arrested.

From statistics given and cases illustrative of those, it is seen that an enormous number of infections occur in the young. Without doubt the greater number of those are undetected during the initial period, and thus the seeds of ill health in after life are sown.

I have described the various symptoms and signs on examination which may lead to the suspicion of tuberculous infection, but the most striking fact is the great uncertainty of all those clinical methods in the commencing stages of the disease.

This is the first and most important feature which has struck me in the investigation of such cases in children, and has/

has led me to endeavour by more accurate measures to arrive at a definite diagnosis, and of those the two most readily accessible are X-rays, and the Von Pirquet test, and I give my results of the application of these two methods in the series of cases appended.

Much has been written with regard to both methods, but it occurred to me that by confirming the one method by the use of the other, something might be learnt as to their respective value as diagnostic agents. This I have endeavoured to ascertain, and the results arrived at warrant the statement that given a positive tuberculin reaction with signs on a radiogram of enlargement or opacity of the thoracic glands, tuberculous infection is made certain, and the case should be treated as one of incipient pulmonary tuberculosis, notified as such, with speedy removal to a sanatorium or suitable institution where such necessary treatment can be carried out.

This may seem at present an idea impossible of attainment, but with the increasing activity in preventive medicine, for which the State is responsible, some effort on those lines would be feasible, and suitable arrangements might be made in the large centres in each area for X-ray examination of suspected cases. This would materially assist the practitioner and help him in what is now one of his most difficult problems.

At the same time the public at large must be informed and educated/

educated in the present day conception of tuberculous disease; of the fact that it attacks so many children, and that if detected early and treatment instituted, no evil effects may ever occur, and that notwithstanding the fact that a child is at one time labelled by the dreaded title of "tuberculous," there is no stigma attendant on such a designation, and that tuberculosis is simply an infection to which everyone is liable and from which 90% of the population suffer at one time or another. The aim of the State being to reduce this high tuberculosis rate and especially to reduce it in its most frequent victims, namely, young children.

List of Cases.

Case 1. A girl, age 2½ years, had whooping cough with a subsequent broncho-pneumonia with persisting crepitations and tubular breathing in left axilla. The family history was excellent except for the fact that the child's nurse had at one time been a patient in a sanatorium. The sputum collected by Holt's method was negative after the illness had run two months, as also was the Von Pirquet reaction. The chest was not X-rayed. Tuberculous infection was negatived by the result of the Von Pirquet test, and treatment instituted by a mixed Streptococcal and Pneumococcal vaccine, resulting in a complete cure in a few weeks time.

Case 2. A male aged 7 with a history of steady loss of flesh for several weeks. Sleeps badly, appetite poor, can't get up in the morning. Cervical glands on both sides enlarged and easily palpable - no cough - chest poorly developed, but no other signs of lung disease.
There was no evidence of infection from other members of the family, but the father is a drunkard and the child's home surroundings are extremely bad.
A positive and persistent Von Pirquet reaction was obtained/

tained, and in a radiogram of the chest, well marked peri-bronchial shadows were seen on both sides. The case was diagnosed as one of latent tuberculosis, and is awaiting sanatorium treatment.

Case 3. A girl age 8. Cough for three weeks, very anaemic and growing rapidly. Weight much below standard, no glands palpable, and no sign on examination of chest. She is an orphan, but no history of tubercle in parents. A positive Von Pirquet reaction was obtained, and on radiographing the chest, there were indefinite shadows in the area of the root glands on both sides.
Diagnosis - latent tuberculosis.

Case 4. Boy age two years. Acute Broncho-Pneumonia, and subsequent empyema. Family history as regards tuberculosis eminently satisfactory. He is the last of a large healthy family. The Von Pirquet test was decidedly negative. (Since the above note was taken in 1920, I have observed this boy who has remained in very good health since his operation for Empyema, and no sign of tubercle has developed.)

Case 5. A girl age 3. With history of wasting and enlarged cervical glands. She still continued to lose flesh after correcting the diet and digestion. She gradually improved/

improved after some weeks constant rest with open-air treatment. Her father is a healthy man, but her mother is frail and very anaemic, with chronic bronchitis. The home conditions are very bad - seven people living in one room. A delayed positive Von Pirquet reaction was given on testing the child, and the X-ray photograph showed distinct shadows on the left side, not seen on the right, a good photograph was obtained and a diagnosis of tuberculosis, thereby made. The child is now a year older, and has improved during this period, and has as yet shown no further evidence of lung infection.

Case 6. A girl age 9 with enlarged cervical glands on both sides. General physique very poor. Her mother stated that since an attack of influenza two months previously, she had wasted greatly and been very listless. Good family history, and home surroundings, and no signs of lung disease on clinical examination. A positive Von Pirquet reaction was obtained, and on radiography, although no root shadows were seen, there appeared to be a darkening due to opacity of the glands at the tracheal bifurcation. No lateral view was obtained. A diagnosis of tuberculous cervical glands was made, with latent infection within the chest. She is now fairly well, the neck glands are much smaller, and she is back at school.

Case/

Case 7. A baby girl age one year and eight months, with symptoms of developing rickets and frequent diarrhoea. Parents healthy, but three children in same family died in infancy from wasting. No signs were evident in the chest apart from bronchitis. The Von Pirquet test was positive, but the reaction quickly passing away. A Radiograph showed opacities at the hilus of both lungs, so definite that they were interpreted as caseating glands. This child died from general tuberculosis three weeks later.

Case 8. A boy age 13. Always delicate, frequent attacks of bronchitis with cough and shortness of breath. Never been able to attend school with any regularity. Palpable glands on both sides of neck. Impaired note on percussion over right upper lobe in front and behind with harsh expiration and increased resonance. T.B. found in sputum. No family history of consumption. Other children healthy. Definitely positive Von Pirquet test. On X-ray examination large shadows were seen round the hilus on both sides, but nothing noted in lung substance of right upper lobe. Diagnosis, active tubercular infiltration/

tion of Right lung with massive mediastinal glandular involvement. Case notified as one of active pulmonary tuberculosis and is improving rapidly with sanatorium treatment.

Case 9. Baby-boy age 1.6/12 years. Three recent attacks of bronchitis, and now has a Broncho-pneumonia. No glands in neck enlarged. General physique good, with good healthy family history and home surroundings.

Von Pirquet test negative.

No X-ray examination was made, as the baby was too ill. Since the above notes were made this baby has recovered and has been well for four months, with no trace left of lung disease.

Case 10. Boy age 2½ years. Acute stomatitis with large ulcer on inside of cheek. Cervical glands enlarged in carotid region on both sides of neck. General condition very poor - no physical signs in lungs.

Father has pulmonary tuberculosis and lives with the child.

The Von Pirquet test was positive and persistent lasting for 9 days.

On X-ray examination shadows were seen along both sides of/

Case 10. (Cont.) of trachea.

Diagnosis - Latent tuberculosis with infection of the thoracic glands. The septic mouth has now healed, and the boy is in better health, but is subject to frequent colds, and periodical attacks of slight fever, headaches and loss of appetite.

Case 11. A male age 4½. Lupus from frequent attacks of bronchitis with asthma. Thin but firm and wiry. Slightly enlarged glands in neck. No physical signs in chest. A positive Von Pirquet was given. On Radiography a suspicion of hilar opacity was noticed with diminished movement on left side.

A diagnosis of latent tuberculosis supervening on an asthmatic was made. The tests were made eighteen months ago, but hitherto no further lung involvement has taken place.

Case 12. A Boy age 2.7/12. Had vague abdominal pains for three weeks, no evidence of acute disease, but lost appetite, colour and flesh. Lystolic murmurs heard at base. Von Pirquet test was positive, but no abnormality was seen by X-rays. The boy is now well and apparently in good health, but, on account of the positive tuberculin test he is kept under observation, and is examined periodically.

Case 13./

Case 13. A boy age 3.4/12. This boy died in December, 1922, at the above age. His previous history was as follows:- Was in Wemyss Hospital 2 years ago with Broncho-pneumonia, and 6 months later had a recurrence, and was treated in the Sick Children's Hospital, Edinburgh, for three months. Admitted again to Weymss Hospital, three weeks before death, suffering from general tuberculosis. Rales all over chest and back, with persistent cough and hectic fever. Enlargement of cervical glands. Distinctly positive Von Pirquet done by McNeil's method. Well marked opacity round both bronchi on X-ray examination with opacities in right upper lobe. The child died from tuberculous meningitis three weeks after the tests were made.

Case 14. Female 1 year 9 months old. With broncho-pneumonia a month previously, subsequently tonsilitis with enlarged cervical glands and croupy cough. Right ear discharging, teeth very soft and already decayed. Negative Von Pirquet reaction and nothing observed to indicate lung disease on X-ray plate.

Home surroundings bad. Mother is relieved by the Poor Law. Father killed during the War.

Diagnosis - Non-tuberculous. Tonsils and adenoid growths/

growths removed. Rapid and apparently complete recovery. Child now thriving.

Case 15. Female age 1.3/12 years. Diarrhoea of three weeks' duration with mucous in quantity. Lost 1 lb. 8 oz., in weight since illness commenced. Slight troublesome and persistent cough. Von Pirquet test negative, and nothing to be seen on X-ray examination. Cough and diarrhoea soon yielded to treatment and the negative tuberculin test has so far been borne out, the baby remaining well now for some months.

Case 16. A boy aged 3.1/12 years. Several weeks failing, losing weight. Enlarged neck glands both sides in addition has a corneal ulcer - very intractable. His uncle has pulmonary tuberculosis and the child was frequently exposed to infection from this source. A definite positive Von Pirquet reaction and Radiography showed enlarged mediastinal glands on right side.
Diagnosis - Mediastinal and cervical gland tuberculosis. Tubercular Keratitis. Treatment by tuberculin instituted with great benefit. The glands were reduced in six weeks to at least one third of their size, and the eye ulcer healed even more rapidly.

Case 17/

Case 17. Female age eleven years. Thin and poorly developed girl. Small glands palpable in neck and axilla. Percussion note impaired in front and behind over left apex, with altered breath sounds and dry rales. Had a slight haemoptysis. No T.B. found in sputum. Home conditions bad. Mother died from malignant disease of abdomen. Father a drunkard - other children appear healthy - no history of tuberculosis. Rapidly appearing Von Pirquet test, reaction well marked in 12 hours' time. On Radiography a dark mass was seen on plate to right of trachea. ? Caseating glands. Diagnosis - Pulmonary tuberculosis. Case still in Sanatorium - improving.

Case 18. Female age 9. When first observed, pain over left sacro-iliac joint. General condition very poor. Planoid chest. Most miserable home surroundings. Mother tuberculous and two younger children died in early infancy, apparently from general tuberculosis. Von Pirquet strongly positive. Chest screened and plate taken when pelvis examined. Root glands showed distinct opacities on both sides. Case diagnosed as Sacro-iliac tuberculosis, notified and sent to Glenlomond Sanatorium. She died after six months' treatment, from general tuberculosis.

Case 19./

Case 19. A boy age 1.6/12 years. Symptoms - general marasmus. Living with his mother in a model lodging house. No definite physical signs to account for the wasting. No signs of syphilis, Von Pirquet test positive, lasted over 14 days, as a well marked reaction. No X-ray examination made. Six months after the test made, child died in Wemyss Hospital from tubercular peritonitis.

Case 20. Male aged 7. Tuberculosis of left hip joint - with subsequent cold abscess. Examination of chest negative. Family history very satisfactory. Von Pirquet test strongly positive, and persisted for over fourteen days. X-Ray examination of chest negative. Child removed to hospital. Abscess aspirated and iodoform emulsion injected. Discharged from hospital in very satisfactory condition. No development of tuberculosis elsewhere.

Case 21. Male age 5½. Swelling of both knees - 2 months duration. Much thickening of articular surfaces and synovial membranes. Sinus with sero-purulent discharge over front of left femur. Wassermann reaction negative. Pus examined at Royal College of Physicians, Edinburgh. No Tubercle bacilli found. Culture injected into guinea pig with developemnt of definite tuberculosis/

Case 21. (cont.) culosis. No tubercular family history - parents both alive and well. Von Pirquet test positive, but reaction lasting only 48 hours. X-ray examination of chest negative. Diagnosis bilateral tuberculosis of knee joints, commencing in lower ends of femora.

Case 22. Boy age 4 - patient not thriving - frequent attacks of diarrohoea. Examined under general anaesthesia - no evidence of abdominal tuberculosis discovered. Left apex suspicious on clinical examination of chest. Family history and home surroundings satisfactory. Von Pirquet test positive. A Radiogram of the thorax showed suspicious darkening at left apex, with want of clearness round both lung roots. Diagnosis - mediastinal tuberculosis infiltrating left lung. Sanatorium treatment carried out for four months, with result that the boy is now well, and the disease apparently arrested.

Case 23. Female age 14. Suffered for several years from a lupoid patch on left cheek. Very untractable. Treated by me for a prolonged period with brass ointment, with benefit. Wassermann test negative. Parents healthy - oldest of nine children, of which three died in infancy. Von Pirquet test positive. No X-ray examination carried out. Diagnosis - Tuberculous dermatitis. Remains unhealed.

Case 24/

Case 24. Female - age 9 months. General wasting. Filthy home. Von Pirquet test definitely negative and X-ray examination of chest negative. Child subsequently died in an attack of acute broncho-pneumonia after measles. No evidence found to point to tuberculosis.

Case 25. Male age nine months. The twin of previous case, and equally wasted. Von Pirquet test negative, as also X-ray examination of chest. The wasting evidently, as in his sister, due entirely to neglect.

Case 26. Male age 2½. Enlargement cervical glands both sides. Father has pulmonary tuberculosis, contracted in the Army. No evidence in throat or mouth to account for the adenitis. Definitely positive Von Pirquet test, and on Radiographic examination, the plate showed large shadows on both sides round the hilus of each lung, and on the left side an extension of this darkening was seen extending along the left border of the trachea. Diagnosis - Tubercular cervical adenitis, and mediastinal latent tuberculosis. Main mass of cervical glands removed surgically six months ago, and since then the child has been in Sanatorium, and general health and chest condition rapidly improving.

Case 27./

Case 27. Female age 12. Admitted to hospital as a case of acute appendicitis. Found on laparotomy to be one of tabes mesenterica with caseous glands along root of Mesentery; the latter adherent to appendix and caput-coecum. Family history not good, and an aunt suffers from pulmonary tuberculosis. Von Pirquet test strongly positive, done a week after laparotomy; patient not X-rayed as her condition at the time was unsuitable. She improved rapidly after operation, and is now to all outward appearances well.

Case 28. Female age 1.1/12 years. Suffered from an acute abscess in neck, but suggested a possible tubercular infection. The Von Pirquet tests and chest radiography both gave negative results, and the child has kept well since, over a period of two years.

Case 29. Male age 4. Very unhealthy boy. Severe stomatitis with large foul abscess in cheek. Suggested tuberculosis and both apices found dull with fine rales over front and back. Some purulent sputum obtained, but no tubercle bacilli found in three examinations.
Very marked and rapid Von Pirquet reaction appeared in 8 hours. Chest not X-rayed. Diagnosed as general tuberculosis, and has since died.

Case 30./

Case 30. A boy aged one year. Suffered from general malnutrition. Cervical adenitis with abcess formation. Father has pulmonary tuberculosis. Home conditions very bad. Von Pirquet reaction strongly positive, and a good radiographic plate obtained which showed unmistakable evidence of shadows round the right bronchus. Diagnosed as a case of early pulmonary and cervical tuberculosis. General condition improving at present under open-air treatment. Main mass of cervical glands removed surgically and mouth cleaned.

Case 31. Girl - 8.3/12 years. Always thin, anaemic, delicate girl. Frequently unfit to attend school. No physical signs in chest, and no enlarged glands. Has chronic blepharitis. Is an orphan. Father killed. Mother died at child's birth. Lives with her Aunt and is very carefully looked after. Von Pirquet test positive and persistent in type, lasting three weeks, due probably to child's deficient vitality. The radiogram of chest was negative. No signs of glandular deposits being visible. The general debility and anaemia together with the positive Von Pirquet test suggest tuberculosis of a latent type, as the cause of the persistent ill health, and a lateral view/

Case 31. (Cont.) view of the thorax would probably show some glandular involvement.

Case 32. Female age 4. Symptoms - general weakness, and failure to gain weight, frequent attacks of enteritis with abdominal pain. Nothing revealed in examination of the chest. Parents healthy.
Von Pirquet test negative, and radiographic examination of thoracic contents negative. The child has now improved, and as yet there are no signs of tubercle present.

Case 33. Girl aged 1.9/12 years. Up to this time had been an exceptionally healthy child, then developed an acute bronchitis, with the usual physical signs. A Von Pirquet test was made towards the end of her illness, as there seemed some tendency to a chronic bronchitis. The test was negative, and since, the baby has got well with no traces left in chest.

Case 34. Female child aged 1.5/12 years. When first seen child in a very poor state of health. Emaciated, with large distended abdomen, with rales over chest and back. Family history and home bad. Father unemployed, with chronic bronchitis. One sister died in infancy, and an older sister has a strumous Keratitis. Von Pirquet test positive and persisted with a well marked reaction for/

Case 34. (Cont.) for ten days. Chest not examined by X-Rays. Diagnosis - Active tuberculosis in lungs and tubercular peritonitis. Death occurred from meningitis three months afterwards.

Case 35. Male aged 13. Suffered from very troublesome and frequent attacks of bronchitis with semi-asthmatical attacks. Glands in neck enlarged and palpable on both ribs. Pale, thin and growing rapidly. Home conditions good, lives in a good miner's cottage with healthy careful parents. Von Pirquet test positive. No X-Ray photograph obtained.
Diagnosis - latent tuberculosis accounting for the bronchitis.

Case 36. Baby boy aged 9/12 years. Small pasty-faced unhealthy baby. Pronounced nasal obstruction, posterior nares blocked by adenoids. No family history of tuberculosis. Von Pirquet test negative. Not X-Rayed. Adenoids removed with great improvement in general condition.
Diagnosis - debility from nasal obstruction, no tubercular infection present.

Case 37. Female aged 13.6/12 years. Clinical signs denoting pulmonary/

Case 37. (Cont.) pulmonary tuberculosis involving both upper lobes. Rapid development after influenza. Lives in a very poor home, and her mother and sister both died from pulmonary tuberculosis. Von Pirquet test gave a very definite positive result. Chest not examined radiographically. She died 5½ months after coming under observation.

Case 38. Girl aged 10 years. With enlarged cervical glands, chest negative to clinical examination. Her father has chronic non-tuberculous bronchitis. Mother healthy. Von Pirquet test positive, usual type of reaction. Chest not X-rayed.
Diagnosis - tuberculous infection of cervical glands. Main mass of glands excised with benefit. General condition as well as local very much improved by treatment in hospital and subsequent inunction of tuberculin.

Case 39. Boy aged 8 years, with cervical adinitis and suspicious physical signs on right side in inter-scapular region. Parents are healthy, but an anut has pulmonary tuberculosis, and is at present undergoing sanatorium treatment. Von Pirquet test positive with persistent reaction lasting sixteen days. On radioscopy/

Case 39. (Cont.) scopy well defined bronchial gland opacities visible on both sides of chest. Diagnosis - Tuberculosis latent in thoracic glands and in cervical lymphatics. Treated at home by tuberculin inunctions. Rapid general and local improvement. Cervical glands now barely perceptible.

Case 40. Boy aged 2½ years. Suffered from an acute non-purulent effusion on left side. Both parents alive and healthy - no history of tuberculosis in family. Von Pirquet test positive with usual type of reaction. A diagnosis of a tubercular infection was made, and the chest X-rayed. On the radiogram, the left side was obscured by the fluid in the chest, but on the right side the peri-bronchial glands were seen to be distinctly enlarged. The fluid gradually absorbed without aspiration, and a gradual and seemingly complete recovery was made.

Case 41. Girl aged 2 years. Weakly and unhealthy baby, developing rickets. No physical signs of lung disease made out on clinical examination. No glands obviously enlarged. Mother is a delicate woman and gives a positive Von Pirquet test. The Von Pirquet on the child/

Case 41. (Cont.) child was negative, and a radioscope examination was also negative. No photograph was taken owing to the child's restlessness. Child now improving (6 months later) and the cause of the malnutrition, evidently neglect and rickets.

Case 42. Female aged 6 years. Very poorly developed girl. Large abscess in neck. Chronic nasal discharge - ? Stigmata of congenital syphilis. The parents' health suggests specific disease. The father has a chronic ulcer of his leg, and the mother gives a history of two abortions. The Von Pirquet test was positive and gave a persistent reaction. A radiogram of the chest showed distinct darkening round the roots of both lungs, and heavier opacities on the right side suggesting calcification of a bronchial gland.
Diagnosis - Congenital syphilitic with tubercle involving thoracic glands at present latent.

Case 43. Boy aged 1 year. Dirty, neglected, badly nourished baby, with severe impetigo and a chronic running ear. The parents and other children, of whom there are several, appear generally healthy. Von Pirquet test negative. No radioscopic examination.
Diagnosis - not tubercular.

Case 44/

Case 44. Boy aged 6 years. A thin, very anaemic boy. Suffers from chronic blepharitis and high degree of flat foot. The brother of Case 33. Von Pirquet test negative. No radioscopic examination. The chronic eye inflammation susbsided with glasses, and a definite diagnosis excluding tuberculosis was obtained.

Case 45. Boy aged 1.11/12 years. Suffered from a tubercular abscess in right hip joint. Removed to hospital, where he died from general tuberculosis in four weeks' time. A Von Pirquet test done three weeks before he died was strongly positive. No X-ray examination of lungs was made.

Case 46. Male aged 3½ years. General malnutrition stated by parents to have been since birth. Chest examination gives unusual dullness to right of sternum. No cough or symptoms of chest disease, and no sputum to be obtained. Family history as regards tuberculosis very bad. Father died from consumption and an elder brother and two sisters all have evidence of a tubercular infection. Von Pirquet test positive and very persistent in type, lasting over 3 weeks. A radiogram of the chest showed an outline of glandular masses along the right and left of the mid line. A diagnosis of active tubercular infection following on

a/

Case 46. (Cont.) a period of latent disease, was made and the case notified, with subsequent removal to sanatorium.

Case 47. Male aged 7. Swelling on right shin, four weeks' duration. No history of trauma, X-ray of shin showed periosteal thickening. Wassermann negative. No improvement with Potassium Iodide. Family history as regards tuberculosis not satisfactory. No definite history of any near relative having consumption, but on the whole there is a strong possibility that the father had a pulmonary infection while in the army. Von Pirquet test positive, and chest then X-rayed with an absolutely negative result, nothing abnormal being seen in the thorax.

A diagnosis of traumalic periostitis was made, and the case was considered non-tubercular in origin in spite of the positive Pirquet test. This case was subsequently found to be one of periosteal sarcoma.

Case 48. Male 5/12 years. Illegitimate - a fortnight premature. Has a persistent cough with rapid wasting. Swab taken from throat by Holt's method. No tubercle bacilli found. Mother healthy and has no signs nor symptoms of tubercle. Von Pirquet test positive, but rather a slight reaction. Not X-rayed. Died suddenly when seven/

Case 48. (Cont.) seven months old. No evidence of tubercle discovered.

Case 49. Boy aged 3½ years. Badly neglected, wasted child with chronic corneal ulcers, which improve when taken away from mother and left with friends who look after it properly. No physical signs in chest, beyond occasional slight bronchitis. Negative Von Pirquet test, and on X-ray examination no abnormality detected.
Diagnosis - no tubercular infection. Corneal ulcers heal when child given attention and fed properly.

Case 50. Boy aged 5 years. Recent severe attack of lobar pneumonia, otherwise child appears well. Mother a healthy woman, but Father suffers from pulmonary tuberculosis. Von Pirquet test strongly positive after the pneumonic crisis. A radioscopic examination showed well defined shadows on medial aspect of right lung, which appeared due to some remaining pesuary thickening. The Peribronchial lymph glands were shown as dark shadows around the hilus on both sides.
Diagnosis - Acute pneumonia with subsequent rapid tubercular infection. Since then the child has remained constantly unwell, with frequent attacks of bronchitis and one other attack of pneumonia, bronchial in type. Now notified as suffering from pulmonary tuberculosis.

Case 51/

Case 51. Male aged 3½ years. Swelling of ankle commencing six weeks previously, was thought to have twisted the joint. Family history free from tuberculous taint. Von Pirquet test positive. Child admitted to hospital and ankle and chest X-rayed, when the thoracic lymph glands were found to be enlarged on both sides. Child developed tubercular meningitis, and died six weeks after admission to hospital.

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